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III. A Monograph of the Coniferous Genus *Thuja*, Linn., and of the North American species of the Genus *Libocedrus*, Endl.

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ten are also recorded in Mr Mitten's paper on the "Bryologia of the survey of the 49th parallel of lat.," in 8th vol. of *Linnean Journal*; the remaining three are *Pottia Pöppigiana*, found in Eastern Chili by Pöppig.; *Polytrichum semi-pellucidum*, found by Humboldt and Bonpland near "La Garita del Paramo de Quindiu," Andes; and, finally, *Splachnum purpurascens*, found in Auckland and Campbell Islands, and, therefore, I believe, an addition to the muscologia of the American continent, and, it may be worthy of remark, in nearly the same latitude both north and south.

The Hepaticæ are twelve in number, ten of which are well-known European forms. Eleven are already recorded by Mr Mitten (*loc. cit.*), the only addition being *Sendtnera adunca*, long known under the name *Jungermannia juniperina*.

With better opportunities, and at a more favourable period of the year, Mr Brown's collections at the Queen Charlotte group would doubtless have been more extensive.

III. *A Monograph of the Coniferous Genus Thuja, Linn., and of the North American species of the Genus Libocedrus, Endl.* By ROBERT BROWN, Esq., F.R.G.S.

The genus *Thuja* was nominally indicated in 1700 by Tournefort, in his "Institutiones Rei Herbariæ," p. 358, but Linné in 1753 reserved the name in his "Species Plantarum" for a genus of Monœcia Monadelphia, embracing certain Eastern and American forms; but as the genus is now defined, all of these, with the exception of *Thuja occidentalis* are transferred to Don's genus *Biota*, distinguished from *Thuja** by its wingless seeds.† To this restricted genus Nuttall, in his "Rocky Mountain Plants," p. 52, added the finest species yet discovered under the

* Defined in the "Genera Plantarum." (Ed. 1764), as "*Masculus Flos*.—*CAL. Amentum* ovatum, constans rachi communi, cui flores oppositi, triplici oppositione apponuntur. *Singulus flos* pro basi agnoscit *Squamam* subovatam, concavam, obtusam. *COR.* nulla. *STAM. Filamenta* (in singulo flosculo) quatuor, vix manifesta, Antheræ totidem, basi squamæ calycinæ adnatæ.—*Femineus flos* in eadem planta. *CAL.* Strobilus communis subovatus, flosculis oppositis compositus: constans *squamis* bifloris, ovatis, convexis, longitudinaliter conniventibus. *COR.* nulla. *PIST. Germen* minimum, *Stylus* subulatus, *Stigma* simplex. *PER.* Strobilus ovato-oblongus, obtusus, longitudinaliter dehiscens: squamis oblongis, fere æqualibus, extrorsum convexis, obtusis. *SEM.* oblonga, longitudinaliter cincta ala membranacea, emarginata. *OBS.* *Cupresso maxime adfinis*"

† Don, in. Lambert's *Pinetum*, Ed. 2, ii. 129. *Platyclusus*, Spach. *Hist. Nat. Veget. Phaner.* xi. 333, excl. spec.

name of *Thuja gigantea*—a tree found on the Pacific slope of the Rocky Mountains, where Douglas had already, in 1839, discovered it independently, and, apparently ignorant of Nuttall's prior description, had indicated it under the MS. name of *Thuja Menziesii*, in honour of the veteran Menzies. Prior to this, however, Menzies had discovered a form of this species on the western shores of Vancouver Island, which James Don described in the 6th edition of "*Hortus Cantabrigiensis*," p. 249, as *Thuja plicata*. In 1847, Endlicher further subdivided the groups, forming in his "*Synopsis*,"* p. 42, the genus *Libocedrus*, distinguished from *Biota* and *Thuja* by the strobilus being quadrivalvate, monospermous, and the seeds unequally winged. To this new genus he referred two South American species (*Thuja tetragona*, Hook.), and (*T. Chilensis*, Hook.), and one New Zealand species (*Thuja Doniana*, Hook.) In 1850 Torrey described, in his *Plantæ Fremontianæ* ("*Smithsonian Contributions to Knowledge*," vol. vi. pp. 7, 8), another fine North American species of the genus under the name *Libocedrus decurrens*, Torr. The paper descriptive of his plant was read in abstract to the "*American Association for the Advancement of Science*," in August 1850, and accepted for publication by the Smithsonian Institute in September of the same year; but the volume containing the contribution was not published until 1854, and it is just possible did not reach this country until that year. The question of priority is not, however, affected by this; for it was not until the end of that year that the Oregon Botanical Committee, in their printed account of some Coniferæ collected by Mr John Jeffrey in North-West America, described, under the name of *Thuja Craigana*, specimens procured by that ill-fated collector from Scott's River in Upper California (October 29, 1855). This tree had already been described by Torrey from specimens found by Dr G. Ed. Hulse; though so far back as 1843 the botanists of the United States Exploring Expedition had brought home fruitless branches. Under this name plants will be found very generally distributed throughout the country coupled with an idea that it is the same as Nuttall's *Thuja*

* "*Synopsis Coniferarum*; auctore Stephano Endlicher; Sangalli," 1847 "*Genera Plantarum*," iv. pars. 2. No. 1794.

gigantea, though (independently of the species having no affinity, except in the general *tout ensemble* of the tree) Torrey expressly states that the species "has probably been confounded by some botanists with *Thuja gigantea* of Nuttall, from which, however, it can be distinguished by the foliage alone; the long decurrent bases of the leaves being characteristic of the *Libocedrus*." The way this idea originated is, that Carrière, in his "*Traité Général des Conifères*,"* apparently totally unacquainted with Nuttall's plant, and only knowing Torrey's from a description in the "*Gardener's Chronicle*," settles them in his work as the same species, and states that the plant described by Hooker† as *Thuja gigantea*, Nutt., is not that plant, but what Douglas formerly described as *Thuja Menziesii*—a plant which I have already shown, and which Douglas himself acknowledged, to be *Thuja gigantea*, Nutt. Still further was this statement circulated, when, in 1858, Gordon published his "*Pinetum*,"‡ and copied Carrière's statement without any correction, apparently equally ignorant of Nuttall's and Torrey's plants. Now, one would think that this was enough of entanglement for the synonymy of such a simple matter; but it was fated to be still worse confused. And now I come a little nearer home. In 1864, trusting to the works of Carrière and Gordon, and having, indeed, no other method of arriving at the truth, in the midst of a north-western forest, I sent home a quantity of seeds of *Thuja gigantea*, Nutt., under the name of *Thuja Craigana*, supposing them to be synonyms, and not being able to arrive at a conclusion regarding the priority, I refer to them as such in my various printed and MS. catalogues and letters. Subsequently, in 1865 a much larger quantity of seeds of the same tree reached this country, which I again styled (on the same principle), *Thuja Craigana*, Oreg. Com., and under this name the plant has been extensively

* *Traité Général des Conifères ou description de toutes les espèces et variétés aujourd'hui connues, &c., par Elie-Abel Carrière, Chef des Pépinière du Museum d'Histoire Naturelle de Paris; 1855.*

† *Flora Boreali-Americana*, ii. 165.

‡ The "*Pinetum*," being a synopsis of all the coniferous plants at present known, with descriptions, history, and synonyms, &c., by George Gordon, A.L.S., formerly superintendent of the Horticultural Gardens, Chiswick, assisted by Robert Glendinning, F.H.S., of the Chiswick Nursery, near London. London, 1858.

distributed all over England. About the spring of 1865 I received authentic specimens of Nuttall and Torrey's plants from the Californian botanists, and I then discovered my error, and that of the authors mentioned. I immediately corrected the error in a MS. catalogue, which I sent in May 1865, and subsequently in my printed catalogues ("Farmer," &c.) I have been very particular to keep up this corrected nomenclature. However, on coming home, I find that many of my plants are distributed under the names of *Thuja Craigana*, *Libocedrus Craigana*, *Thuja Menziesii*, &c., and that yet there seems to be the most wonderful confusion in regard to their nomenclature. It is therefore not only with a view to endeavour to unravel this tangled web, but as an offender myself—innocent, no doubt, as only following recognised authorities according to my lights,—that I desire to enter on record this synopsis, in order to correct the mistakes into which some writers on Coniferæ, and cultivators depending on them, have allowed themselves to drop, and to make the *amende honorable* for misleading, for the time being, though unintentionally, as the making of this confession abundantly testifies. During my different journeys in North-West America I had many opportunities of observing the trees of these genera in their native state, and of examining subsequently authentic specimens from the authors who have described them from dried specimens. I had also many chances of observing the variation of the trees according to situation and climate, and therefore of understanding how far the characters which have been employed to separate the species hold good in nature. These observations I have incorporated in the present notes. The synonymy, geographical distribution, and economic and æsthetic aspects of the trees, I have illustrated almost solely from my own researches and observations. All the characters employed to distinguish the plants, specific and generic, I have tested on a large series of specimens, and being originally described by very eminent botanists, I have not been able to do much more than confirm their descriptions. I have therefore, wherever necessary, employed their specific distinctions, rather than run the risk, for the sake of a dubious quasi-originality, of substituting, as has been done, very much inferior ones.

The following diagnosis of the genera, and of the divisions to which they belong, sufficiently expresses the distinctions by which they are separated from other allied genera:—

CONIFERÆ.

§ ACTINOSTROBÆ.—*Strobili, with valvate scales, leaves alternate, opposite or ternate.*

Widdringtonia.—Strobilus, 4 scales, scales equal, 5–10 spermous, seeds two-winged, leaves alternate.

Frenela.—Strobilus, 6 scales, scales small and alternate, polyspermous, seeds 2-winged, leaves ternate.

Actinostrobus.—Strobilus, 6 scales, scales equal, monospermous, seeds 3-winged, leaves ternate.

Libocedrus.—Strobilus, 4 scales, scales small and alternate, monospermous, seeds unequally winged, leaves opposite.

Callitris.—Strobilus 4 scales, scales alternate, small, dimonospermous, seeds 2-winged, leaves opposite.

§ THUIOPSIDÆ.—*Strobilus with imbricated scales, not valvate as in Actinostrobeæ, leaves opposite.*

Biota.—Strobilus, with leathery scales, dispermous, seeds wingless.

Thuja.—Strobilus, with leathery scales, dispermous, seeds 2-winged.

Thuopsis.—Strobilus, ligneous scales, pentaspermous, seeds 2-winged.

The diagnoses of *Libocedrus* and *Thuja* are further given in parallel columns, in order to show more clearly the distinctions, as well as the characteristics, of the two genera:—

THUJA, LINN.*

LIBOCEDRUS, ENDL.

<p><i>Flowers</i> monœcious on different branches. <i>Staminiferous aments</i>, ovoid, very small, terminal on the lateral twigs. <i>Stamens</i>, oppositely decussate imbricated in four rows;</p>	<p><i>Flowers</i> monœcious on different branches. <i>Staminiferous aments</i>, terminal on the lateral twigs, sub-cylindrical. <i>Stamens</i>, 6-7 inserted filaments very short, the</p>
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* Though the genus was described nominally by Tournefort, I have yet given Linné as the authority, it being a mere useless piece of pedantry to go further back for generic authority than the revival of Botany on the publication of the "Species Plantarum," merely because some of Linné's predecessors happened to have applied a similar name, though that name conveys a totally different meaning from what we now-a-days understand by the word. For instance, we would not give Theophrastus as the founder of the genus *Cedrus*, his *Κίβρος* being a species of *Juniperus*. Equally might we give Theophrastus, or even Homer, the credit of founding *Thuja*, the latter (*Odyssey* ii. 6) talking of a *Θύισ*, and the former of *Θύισ* and *Θύια*, both being, probably, a *Callitris*. However, from this incense wood used in sacrifices, the modern name *Thuja* is taken. It is sometimes written *Thuia* and *Thuya*, which latter spelling Linné gives in the index to his "Genera Plantarum," though the more common one (*Thuja*) is adopted in the body of the work.

produced in a deltoid or sub-orbicular excentrically peltate scale, and bearing on its under surface about 4 oblong anther cells opening longitudinally. *Seminiferous aments*, terminal solitary on the twigs. *Gemmiferous scales* 4, mucronate under the apex, verticillate, two smaller. *Ovules* at the base of the scales, collateral erect, atrophied, the micropyle prolonged into a short bottle-shaped neck. *Cone* ovate, four-valved, valves ligneous or sub-coriaceous, with the back below the apex mucronate, in the form of a well-developed spine or a minute tubercle, within plain or concave, alternate scales smallest, sterile or monospermous. Seeds solitary at the base of the scales, erect, lenticularly compressed, with a tough integument, prolonged on either side into a membranaceous wing, the one wing small, the other large, spreading out above, and equally the scale in size. *Embryo*, antitropal. *Cotyledons* 2. *Radical*, cylindrical superior. *Leaves*, scales oppositely decussate, all equal, or navicular, plane, sometimes with a gland. *Cone*, mature yearly. *Tree*, evergreen. *Range*, North and South America and New Zealand.

connective excentric, peltate, blunt, orbicular, *loculi* 4 horizontal, longitudinally dehiscent. *Seminiferous aments*, solitary terminal on the lateral twigs. *Gemmiferous scales*, 8-10 oppositely decussate, sessile with a broad base, mucronate under the apex, at first spreading, afterwards adpressed and imbricate, outside one 2-seeded at the base, inside ones sterile; *Ovules* at the base of the scales 2, collaterals erect, atrophied, with the micropyle shortly prolonged in a bottle-shaped form. The *cone*, composed of scales imbricated in four rows, subcoriaceous, oval, or oblong, plain or subconvolute, obtuse with the apex hardly thickened, the back pointless or mucronate, inside ones smallest and sterile. *Seeds* at the base of the scale 2 collateral, and sometimes solitary and abortive, erect, lenticularly compressed with the integument, tough, and hollowed out into resin-bearing foveolæ, expanded on either side into a membranaceous wing, emarginate at the base and apex. *Embryo*, antitropal. *Cotyledons*, 2-5. *Radical*, cylindrical, superior. *Leaves*, navicular, adnate, persistent, oppositely decussate, imbricated in four rows, cones mature yearly. *Tree*, evergreen. *Range*, North America.

GENUS THUJA.

THUJA OCCIDENTALIS, Linn.

Cedrus Lycia.—Clusius, Ic. Stirp. 11; t. 224.

Arborvitæ.—Clus. Hist. Rarior. (1601) 1, 36; Dodonæus, Pempt. Stirp. 630 (1616); Houttyn Lin. Pl. Syst. 2, p. 372 (1777-1788).

Thuja Theophrasti.—Bauhin's Pinax, 488 (1671).

Thuja strobilis levibus, squamis obtusis, Linn.; Hort. Cliff. 449 (1737); Hort. Upsal., 289 (1748); Royen, Prod. Fl. Leidensis., 87 (1739); Kalm. It. Am., 3 pp. 339 (1753); Miller's Gardeners' Dict., n. 1 (1760); Du Roi Harbk., 2 p. 455 (1767-1772, *fide* Willdenow); Kruph. Bot. in Orig. Cent., 1, n. 91 (1750-1772); Blackwell, Herb., 210 (1737); Wangenheim, Americ. 7, t. 2, f. 3 (1787, *fide* Willd.); Willd. Arb., 385 (*fide* Sp. Pl.)

Thuja occidentalis.—Linn. Spec. Plant, 1422 (1753); Beckmann, Ed. Linn. Syst. Nat., sp. 1078, ii. 304 (1772); Willdenow, Sp. Plant, iv. 508 (1806); Sprengel, Spec. Plant, iii. 888 (1826); Pursh Fl. Am. Sep., 2, p. 646; Smith, in Rees' Encyc., No. 1; Michaux Hist. Arb. F., iii. 29, pl. 3 [good]; Nouv. Duhamel, 3, p. 12; Richard, Mem. sur le Conif. 43, t. 7, f. 1; Nees, Jun. Pl. Fl. German, t. 11, f. 7, 17; Seckuhr. Hand. iii. 287, t. 309 (*fide* Carr.); Desf. Hist. Arb. ii. 575; Loudon, Arboretum, iv. p. 2454, figs. 2312–2313; Endl. Syn. Conif. 51; Lindl. and Gord. Journ. Hort. Soc. v. 206; Knight Syn. Conif., 16; Revue Hort. 1854, p. 224 (*fide* Carr.); Lawson's List. Pl. Fir. Tribe (1851) 57; Carrière, Traité, 103; Gordon, Pinetum, 323; Emerson, Trees and Shr. Massach. p. 96; A. Gray Fl. N. States, 424; Beck, Bot. N. and Middle States, 58.

Thuja obtusa.—Mœnch. Meth., 69.

Cupressus arborescens.—Targ. Tozz. Osserv. ii. 51.

Popular Synom.—Engl: *Arborvitæ*, American *arborescens*. Americ.: white cedar; *arborescens*. French: *cedre Américain*, *cedre blanc*, *arbre de vie*. German: *Gemeiner Lebensbaum*. Italian: *Arbero de vita*.

Sp. char.—*Ramulis ancipitibus strictis, foliis quadrifariam imbricatis late ovatis obtusis in utraque ramuli facie lucidis, marginalibus navicularibus, facialibus planis carinatis, dorso glandula tuberculiformi ovali, strobilis nutantibus, squamis terminalibus truncatis, infra apicem gibbosis.*

Leaves appressed, very small, imbricated in four rows on two-edged branchlets; branchlets very much flattened. Strobili obovate, scales of cone generally 6, truncated, gibbous below the summit, smallest of all the species, seeds broad-winged all around.

It flowers in May, and the cones ripen in the following autumn. It tapers from a small base to a very slender summit. The branches spread out from the stem horizontally, and at irregular intervals; the smaller one curling downward, forming a regular, though not very graceful tree. It branches at about four-fifths of its height. The tree reaches a height of from 20 to 50 feet, and generally grows in thickets, though never forming anything approaching to a forest or wood. It is distinguished from its Pacific representative, not only by its small size and locality, but by its very minute cones, without points. Its geographical range is from about 45° to 32° North latitude. From Canada and New England, where it keeps chiefly northwards, and forms the cedar swamps, it ranges south along the Alleghanies, its southern limits being Virginia and Carolina, where it is rare.* It affects

* I have given these limits, as I am not sure of the specific identity of the "*Thuja occidentalis*" found by M. Borgeau on the Rocky Mountains.—*Blue Book of the Expedition under Captain Palliser*, 1863, p. 260.

swamps, damp soil, and cool, rocky banks of streams, or islands in rivers. It is (like all the species of the genus) confined to North America, and principally to the eastern portion of the continent. Linné no doubt says (Sp. Plant, 1421), "Habitat in Canadæ et Sibiriae subhumidis;" but the species, which Gmelin put in his "Flora Sibirica," vol. v. p. 182 (1747-1769) as *T. occidentalis* is undoubtedly not this species, but probably *Thuja orientalis* (Linn. Spec. Plant, 1422), a species of Biota (*B. orientalis* (L.) Endl.), found in Japan and China under cultivation, but growing wild in the mountains of some of the Japanese Islands.

As a timber tree it is of no great value, never attaining a dimension sufficient for that purpose; but it is still used all over Canada and the Northern States for various purposes. It is light and fine grained, with a pungent aromatic odour, and, like all the genus, is exceedingly durable. (See Michaux, Hist. Arb. iii. 29, and Emerson, "Trees and Shrubs of Massachusetts," p. 96, for particulars regarding its economic value).

VARIETIES.

Horticultural.—It was introduced into England in 1596, and is now generally found all over Europe under cultivation, thoroughly naturalised wherever it is planted. It has sported into a number of varieties, which, though mere foliage varieties, yet maintain the characters, and have received various names:—

(*α.*) var. *variegata*.—Weston, Universal Botanist and Nurseryman, &c., 1, 294 (1770); Stripe-leaved Arborvitæ, *Ibid.* 1, 294; Loudon Encycl. of Trees, 1068.

Thuja variegata.—Marsh Arbor., 243.

Some of the younger branches are of a pale yellow colour, and mixed with the ordinary green of the tree, giving a variegated appearance to the plant. This variety was originally described by Weston (*l. c.*), but he omits mentioning it in a subsequent work (*English Flora*) published in 1775.

(*β.*) var. *odorata*.—*Thuia occid. odorata*, West. *Ibid.* 1, 294; Sweet-scented Arborvitæ, *Ibid. loc. cit.* *Thuja odorata*, Marsh. arboretum (*vide* Gordon). The variety is occasionally distinguished by the character of being more odoriferous than ordinary—a varying character hardly worth mentioning.

(*γ.*) var. *argentea*.—*Thuia occidentalis argentea*, Carrière, *l. c.* p. 103. A variety with the young twigs of a silvery colour, and more delicate than the parent plant.

(*δ.*) var. *compacta*.—*Thuia occidentalis compacta*, Carrière; *T. occidentalis densa*, Gord. Supp. Pin. 103; *Thuja compacta*, Hort, *l. c.* p. 104; *Caucasica*, Hort. A variety expressed by its name.

- (s.) var. *robusta*.—*Thuja occidentalis robusta*, Carrière, l. c. 104; *Thuia Wareana*, Hort. (non Booth); *Thuia occidentalis asplenifolia*, Hort. This is probably the same as *Thuja dumosa*, Gordon, Supp. to Pinetum, p. 102, which he describes as a spreading little bush, densely clothed with numerous short, tufted, flat, fan-shaped branches, growing in all directions, and thickly set with short, forked, two-edged branchlets, of a glossy, light green above, but much paler below, and furnished on the back rib with an elevated transparent gland. "It forms a dense, dwarf, confused little bush, seldom growing more than two feet high," said to be found in the Antarctic regions. This last locality is very doubtful.
- (z.) var. *pendula*.—*Thuja occidentalis pendula*, Gordon, Supp. 103. This variety is said by its describer to differ in having the principal branches along the main stem in a reverted position, and in the branchlets being more densely clustered or tufted towards the ends of the branches, and in a more declining position.
- (η.) var. *Vervœneana*.—*Thuja Vervœneana* "Van Geert." *Thuja occidentalis Vervœneana*. Hort. et Gordon, Supp. 103.—One of the variegated varieties, probably the same as var. (a.) *variegata*.
- (θ.) var. *ericoides*.—*Thuja occidentalis ericoides*; Lawson, in "Illustrated Farmer and Gardener's Almanack," 1867, pp. 102, 103, fig.; M'Nab (Jas.) Trans. Bot. Soc. vol. ix. 61, fig.; "Tom Thumb Arborvitæ," of the American Horticulturists. This, the most recently cultivated variety, has a compact rounded habit, dwarfed, and with most of the leaves having a heath-like appearance.

Another variety is generally known in gardens under the names of *Tartarica*, *pyramidalis*, *australis*, &c., which Mr Gordon thinks is not a *Biota*, as generally stated, but a true *Thuja*, with cones identical with *T. occidentalis*. If so, *T. occidentalis* was found in Siberia as Gmelin has put it; but as far as I can learn, the variety under question was merely reared from the ordinary *Thuja occidentalis* from America, and has no connection with *Biota orientalis*, though Endlicher puts it, from a description of its general habit, and possibly name, among the varieties of that plant* (*tartarica* = *Thuia tartarica*, Hort. Pinet. Woburn. 197), and Mr Gordon finding that Endlicher has put a true *Thuja* among the varieties of a *Biota*, has accordingly come to the conclusion that Endlicher's *Biota orientalis* is a *Thuja*, a conclusion I can hardly bring myself to coincide in, though it is nearly allied to the

* *Thuja aurea*, Hort., is well known to be only a sport of *Biota orientalis*, and *Thuja Verschaaffeltii*, Hort., must come under the same category. Many of the plants labelled with the generic name of *Thuja*, with the superadded one of a specific MS. name derived from some trifling or supposed variation, are not *Thujas* at all, but are to be referred to other genera—in nearly every case *Biota*,—such as *Thuja uncinata*, *T. gracilis*, *T. Fortunii* (?), &c.

genus *Thuja*. There is probably some confusion, which I have not yet been able to detect. Describing and cataloguing the synonyms of varieties is a most thankless task, fruitless of all results, either scientifically or horticulturally. While you are working, new varieties are forming, and old ones returning to the parent stock. Every cultivator has his own pet variety, which he catalogues under a different name, and will not acknowledge to be the same as that of his neighbour. The result is, that it is impossible to arrive even at an approximately correct nomenclature. Luckily, such is not required in science. These examples are given to show the natural bent of the plant, and the general course it seems to take in varying. The botanist has to do with natural varieties, of which there are none which can be classed under the heading of this species. Therefore, though I have endeavoured, for the reasons stated, to catalogue the principal varieties known to me, yet I by no means maintain that I have investigated the whole of them, or that errors will not be discovered in their synonymy.

THUJA GIGANTEA, Nutt.

Thuja gigantea, Nuttall, Rocky Mountain plants, 52; Smith's Ed. of Nuttall's "Sylva," p. 102; Gardener's Monthly and Hort. Advertiser (Philad.), June 1859 (with figures, good); Spach. Hist. Veg. Phan. xi. 342 (Excl. Syn. Dougl.); Endlicher Syn. Conif. 52; Lindl. and Gordon, Journ. Hort. Soc. v. 206 (excl. Synon. Douglas); Revue Hort., 1854, p. 224, fig. 12-14 (*vide* Carrière); Cooper, Nat. Hist. Wash. Terr., Bot. of Route, p. 21, and p. 265 (1860); Newberry, Trees of Oregon, in P. R. R. Surveys, vi. (Williamson's Report) pp. 56, 57, Bot. fig. 22 (good); Lyall, Journ. Linn. Soc. Bot. vii. No. 27 (1863), 144; Hittel, Resources of Cal. 1st ed. p. 97 (1863); Hook, Fl. Bor. Am. II., 165. Carrière *Traité (partim)* 105; Lawson, Cat. (1851) 57.

Thuja Menziesii, Dougl., MS.; Carrière *l. c. (partim)*, 106; Gordon, Pinetum, 323; *T. Lobbii*, Hort.; *T. Lobbiana*, Hort. "*Thuja Craigiana et T. gigantea*," R. Br. min. (*vide* Gordon et Carrière) in *literis* 1863-1865; postea "*T. gigantea*," Sol. *Thuja Nuttalliana*, "Dougl," *vide* Gordon, Supp. p. 102. ? *Abies microphylla*, Rafinesque, Atlantic Journal, 119.

Popular names.—Cedar, White Cedar (in Puget Sound). The name "White Cedar" is also sometimes applied in Oregon to "*Cupressus fragrans*," Kell. (*C. Lawsoniana*, Murr.?) which is, however, also known by the name of "Ginger Pine," "Port Orford Cedar, and the more indefinite one of "Oregon Cedar."

Sp. Char.—*Ramulis compressis erectis, foliis quadrifariam imbricatis ovatis acutis, marginalibus navicularibus, facialibus convexis. Strobilis magnis, arcte reflexis.*

Leaves in alternate opposite pairs, densely imbricated, sometimes with a gland on the back. Leaves on the rami more distant, attenuated, and decurrent. Cones larger than in any other species, oval, tapering to both ends, but generally with the superior ends reflexed when ripe, swelled in middle. The branches come off from the stem irregularly, and take a downward sweep, describing towards the base an S shaped curve. The branches spread out in a dense, flat form, forming a hollow beneath, almost impenetrable to rain. It branches at a distance of some 30 feet from the base. The tree reaches a height of 250 feet, and a diameter of 40. I measured one in a rich river bottom which measured in circumference at the base 45 feet, or 15 feet in diameter. The bark is smooth, and when old, cracks longitudinally, but is very tough, and is not shed even in old trees. It is one of the most handsome trees in North West America; and being fast growing, and prospering well on damp sandy soil, might be introduced and grown much more extensively in this country than heretofore. As I have said, it seems to have been most strangely confounded with *Libocedrus decurrens*, with which it has no affinities, and with a supposed second species, *Thuja Menziesii*, of which it is only a synonym. Nuttall gave as one of the characters of his plant “*foliis etuberculatis*,” but the dorsal gland is not constant, either on the species or on individual leaves of the same tree, so that the supposed distinction of *Thuja Menziesii*, founded on this (in itself no character), falls to the ground. Moreover, it cannot be distinguished by the paler upper or under side of the leaves; for in its native forests the same plant, in some of its branches, will be pale inferiorly, with stomata, and different on others, or in seedlings growing under its base. Neither can a supposed difference of habit serve to distinguish species allied to this; for this varies according to situation, soil, and climate; and if this was sufficient to form a species, the number might be increased almost indefinitely. Mr Gordon's description of *Thuja gigantea* is undoubtedly that of a *Libocedrus*, and apparently of *L. decurrens*, which he (having surely never seen Torrey's figure) puts down as a synonym of *T. gigantea*, Nutt.—a very different plant of another genus, as Torrey himself specially mentions. The tree itself might be passed at a little distance for *Thuja gigantea*, but is in general of a darker green. In the parts of the country where *T. gigantea* prevails *Libocedrus decurrens* is not found. *T. gigantea* has a range far north, reaching to Lynn Canal in 58° north latitude, and south into California. Its centre of distribution is, however, in the region adjoining Vancouver—the coast of British Columbia

and Washington territory, to the Columbia River, on the western slope of the Cascade Mountains. To the southward, it is far from common, and in California it is a rare tree, while to the east of the Cascades it is only occasionally met with in a scrubby form in the damp dells and river bottoms, but far departed from its pristine glory on the damp banks of the Columbia or the Fraser. In Vancouver Island it is very abundant in such localities; but nowhere does it form a forest, being generally found in single trees, or at most in twos or threes scattered through the pine forests, and generally in poor soil. It is not found at a considerable height on the Pacific seaboard, and on the Cascade Mountains and towards the Rocky Mountains it rises to a good elevation, being found in Utah at a great altitude on that range. As a useful tree it stands pre-eminent before all other trees of North West America in the estimation of Indians and backwoodsmen. On a former occasion* I mentioned that the Indian made scoops of its bark, thatched his hunting-lodge with it, made from it ropes, blankets, cloaks, mats, "tow;"—that he smoked the leaves, dug his canoe out of the trunk (and nothing so thoroughly expresses the enormous size which some of these trees attain, than to see the large and beautiful war canoe which the Indians hollow out of a single trunk), and built his houses of its boards, sewed together with its tough twigs. The backwoodsman in a few hours will run himself up a temporary house with it; and many men are continually occupied in making "cedar shingles" out of its fissile and easily-wrought wood. It is not found in sufficient quantity anywhere to make it an article of commerce at the saw mills; but when it can be got, it is highly valued as a light, durable material for doors, window-sashes, &c. In the ground it is almost indestructible, but not in water. The Hudson's Bay Company, when they wish to build a fort, always endeavour, on account of this durable quality of the wood in the ground, to procure trees of it to form a picket or stockade round their trading post. "Cedar Hill" (Mount Douglas), near Victoria, was so called because the "cedar" trees to form the stockade of old Fort Victoria were taken from that place. Its lasting quality was brought forcibly before me on one occasion. I found the fallen trunk of a tree in the woods, quite decayed on the outside. Growing on the soil thus formed, with its roots now hid in the body of the decayed outside, was another tree. On cutting into I found it to be a cedar almost sound at heart. The tree growing on it was an *Abies Douglasii*, which could not have been less than twenty or thirty years old, and accordingly the tree must have lain dead in the forest for much more than that time. Dr Cooper (*l.c.*) related an instance very similar. In one of the damp, dark forests close to the coast, he saw trunks

* April 9, 1868.

lying prostrate, with several spruces from 3 to 4 feet in diameter growing on them, having evidently taken root in the decaying bark, and, as in the tree seen by me, extending their roots into the ground adjoining, while the interior of the log was found still sound, though partially bored by insects. Judging of the age of spruces by the ordinary rules, this log must have lain hundreds of years exposed to the full action of one of the most moist of climates. On some of the tide meadows about Shoalwater Bay, dead trees of this species only are standing, sometimes in groves, whose age must be immense, though impossible to tell accurately. They evidently lived and grew when the surface was above high-water level—groves of this and other species still flourishing down to the very edge of inundation. But a gradual slow sinking of the land (which seems in many places to be still progressing, and is perhaps caused by the undermining of quicksands) has caused the overflow of the tides, and thus killed the forests, the only remains of which now left are these cedars. This wood is perfectly sound, and so well seasoned as to be the very best of its kind. Continued and careful examinations of such trees may afford important information as to the changes of level in these shores. That these have been numerous and great is further shown by alternating beds of marine shells, and of logs and stumps, often in their natural position, which form the cliffs about the bay to the height of 200 feet. But while these remains show that the changes took place in the latest periods of the pleistocene epoch, there is no evidence in the gigantic forests living on these cliffs, that any *sudden or violent* change has occurred since they began to grow, a period estimable by thousands rather than by hundreds of years.* The tree might, therefore, if extensively planted, soon become (as it is a quick growing species) of use as timber for railway sleepers and other work requiring great durability of wood under ground. Its bark has been recommended for paper-making, and is worth a trial on that account. On the whole, I know of no tree in all North West America more beautiful, more valuable, or more worthy of being introduced into cultivation in Europe. I may mention here that the tree which Mr Gordon, in a note in the Supplement to the Pinetum, p. 102, mentions on the authority of Sir E. Belcher's "Voyage of H.M.S. Sulphur," as being the tree called "Noo-wyas" † by the Sitka Indians, is not the *Thuja gigantea* but *Thuia borealis*, Fischer (*Cupressus Nutkaensis*, Lamb). *Thuja gigantea*

* Cooper, *loc. cit.*

† It is amusing to see how loosely writers on Coniferæ talk of the "Oregon district," "the North West Coast," "California," and what "the North West and California Indians" call such and such a tree. The fact is, that there are more than forty languages and dialects spoken in that wide region, so familiarly spoken of, and that scarcely one little sept has the same name for any tree, and then even that name is often applied to all its congeners.

will not take a fine polish, but the *Thuiopsis* will, and works beautifully. A good deal of the latter is sent down to Victoria on the Metlakathlah Mission schooner, and is eagerly bought by the cabinetmakers in Victoria. It is also valuable for boat-building. Sir Edward Belcher (I am informed by my friend Captain George, R.N., at that time one of the officers of the "Sulphur"), built a boat at Sitka of this wood, and Captain Verney, R.N., used it to repair his boats while in command of H.M.S. "Grappler." He presented a piece to the Museum of the Botanic Garden at Edinburgh in 1865.

VARIETIES.

(A) NATURAL VARIETIES.

(a) var. *plicata*—*Thuja plicata*, Don, Hort. Cantab. Ed. 6, p. 249; Lamb. Pinetum, Ed. 1, 11; 19 Ed. 2: Loddiges, Catal. (1836); Loud. Arb. iv., 2458; Endlich Synop. 51; Carrière, Traité, 102; Gordon, Pin. 51; Spach, Hist. Veg. Phan. xi. 342; Lindl. and Gord. Journ. Hort. Soc. v. 205; Knight, Syn. Conif. 16.

Thuja occidentalis plicata.—Loud. Encyc. Tr. p. 1110, f. 2108.

Thuja Warreana.—Booth, Cat. 1837.

*Specific Char.**—Ramulis complanatis patentibus, foliis quadri-fariam imbricatis, in superiore ramulorum facie lucidis, in inferiore opacis, marginalibus navicularibus late ovatis acutis, facialibus rhombeis obtusiusculis planis carinatis, dorso glandula tuberculiformi orbiculari: strobilis nutantibus.

Loudon (*l. c.*) describes this tree as very branchy, light green, and spreading; the branches dense, often divided, pectinate, compressed; leaves rhomboid ovate, acute closely adpressed, imbricated in four rows, crowded together between the nodes, glabrous, quite entire, showing tuberculation in the middle; shining bright-green above and glaucous green below. Strobili scattered solitary, pendulous; oblong scales, elliptic obtuse, flat, obsoletely furrowed. Seeds compressed and winged all around, marginate at apex, obcordate oblong. This tree was said to have been discovered by Archibald Menzies in Nootka Sound, Vancouver's Island, in 1796, and has been long in cultivation in England under this general name. Most cultivators (even) are agreed that it is only a variety of *T. occidentalis*, and Loudon "has no doubt of it." It is even said that *Thuja occidentalis* will grow into it. And no better proof could be adduced of the frail claim it ever had to specific distinction than the fact that two cultivators, both authors of works on Coniferæ, disagree as to what are varieties of this and what are varieties of *T. occidentalis*.

* After Endlicher.

For instance, Gordon classes the varieties, *compacta* (Knight), *asplenifolia* (Hort.), and *robusta* (Carr.) (which, following Carrière, I have put under the head of *T. occidentalis*), as varieties of *T. plicata*. Indeed, there is scarcely an author who agrees on what is *T. occidentalis* and what *T. plicata*. Even Carrière thinks that “Le *T. plicata* paraît voisin du *T. occidentalis*.” The characters by which it is separated from *T. gigantea*, or *T. occidentalis* are, moreover, not sufficient to constitute a species; habit, darker or lighter green of the branch, being characters varying on the same tree in different situations, or on parts of the same individual exposed to different influences. I could find no tree in nature which I could pronounce to be *T. plicata*, although I sought for it constantly; but I did find, what I now put on the table, seedlings of *T. gigantea*, and branches of the same tree, bearing the characters of this *T. plicata*, as distinctly as the plant known by that name under cultivation. Dr Cooper, whose knowledge of North Western trees is second to none in America, writes, “A second species of *Arboretæ* is said to be found on the islands north of the Straits of Fuca, and probably extends within the Territory. ‘Cedars’ on Whidby’s, and other islands, resemble it in their smaller size and denser branching; but I attributed the variety to soil, and did not preserve specimens.” I have also visited Whidby’s Island, and various other islands in that vicinity, and found what Dr Cooper describes, but came to no other opinion than what he did, viz., that it was the exposed and dry soil of the prairies which made this trifling change in the habit and foliage. I have likewise visited Nootka Sound, where Menzies got his plant, but could find no trees there having the character. Since then, I am given to understand that the tree was not described from Menzies’ plant, but from plants cultivated from seeds of a tree which he brought home. Doubtless this tree was only *T. gigantea*, which has sported into this character. And in confirmation of this, I may mention that I was told that some of the seeds which I took from *T. gigantea* trees have produced “*plicata* plants,” and are so labelled in some collections. On the whole, I think no *botanist* can doubt for a moment but that this *T. plicata* is only a variety of *T. gigantea*. Those who have considered it as a variety, look upon it as a variety of *T. occidentalis*, because *T. gigantea* had not then been known: but I have shown that it equally agrees with *T. gigantea*; and therefore, unless we are to affirm that *T. occidentalis* is nothing but a variety of *T. gigantea*, or *vice versa*, or that it is found on the Pacific slope of the Rocky Mountains (neither of which statements we have grounds for giving adherence to), we must consider *T. plicata* as a var. of the Pacific species *T. gigantea*, and as such I have considered it. Having been so long under cultivation, it has also sported into what are called “varieties of *T. plicata*,” but it would

be hard to say what is the variety and what the species. As, however, they are known as such, to avoid confusion, the only described one may be noted here—

- (1.) Sub-var. *plicata variegata* var. *panachée*—Carrière *Traité*, 102. The variegated Nootka Sound *Arbovitæ*, Gordon, *Supp.* 103, 104.

Differs in having some of its leaves and twigs of a pale yellow colour dispersed over the plant in a variegated manner.*

- (β.) *Microcarpa*, nov. var.—*Thuja*, nov. spec. No. 273, (α) R. Br. min., "Farmer," May 16, 1868.

This variety of *T. gigantea* is so distinct, by its small cones and regular pectinate branching, that I have thought proper to give it a distinct name. I found the tree on the Willamette, near Portland, Oregon, in May 1865, but not, of course, in seed. The tree struck me as curious, from its stunted branches, closely adpressed to the stem; the tree itself reaches a height of 170 feet, and a diameter of some 4 feet. I never visited that part of the country again, and so failed to procure seeds. All the specimens which I examined bore the same character as the one on the table.

GENUS LIBOCEDRUS.

LIBOCEDRUS DECURRENS, Torr.

Libocedrus decurrens, Torrey, in "Plantæ Fremontianæ;" Smith. "Contrib. to Know." vol. vi. pp. 7, 8, plate 3 (good); Torrey, in "Rep. of Explor. and Surv. for a Railroad from Miss. River to Pacific Ocean," &c., vol. iv. 140 (Bot.); "Philad. Month. and Hort. Adv.," l. c. fig. (good); Bigelow, *Ibid.*, 24 (Bot.) Newberry, *lib. cit.* pp. 63–4.

Thuja Craigana, Oreg. Com. (Balf.) Description of Coniferæ collected by Mr Jeffrey (private distrib.) plate (good); Lindl. Gardener's Chr. 1854, p. 53.

Libocedrus Craigana, Hort. (Low).

gigantea, Hort. (Low).

glauca, Hort. (Laws.)?

Thuja gigantea, Carrière, l. c. 105 (*partim*).

Gordon, l. c. 321 et *Supp.* 102.

Cupressus, No. 750. Jeffrey's MS.

Popular names.—"Red Cedar" in Oregon, and in places where *T. gigantea* is also found; "White Cedar" in California.

* In some collections a "*T. plicata*, var. *llaveana*," is found; but this, as well as "*T. Californica*," Hort. aliq., "*T. flagelliformis*," Hort., etc. differ in no appreciable manner from the normal types. To attempt to catalogue the endless MS. names in nurserymen's catalogues, in most cases made without any reference to previous descriptions, would be a worthless and unsatisfactory task. I only refer to widely known or described forms.

*Spec. Char.**—*Ramulis* compressis sub-ancipitis: foliis late ovatis breviter acuminatis apice serratulis longe decurrentibus, lateralibus carinatis, facialibus planis: *strobilis* ovato-oblongis nutantibus. *Squamis* infra apicem spina tuberculiformi recurva auctis, superioribus multo majoribus: *seminalibus* bialatis, alia altera maxima.

Leaves, 4-ranked, as usual in the genus, very small and closely embricated; their bases prolonged downwards and contracted with strongly-marked longitudinal lines, where the two exterior overlap the two anterior ones. In the younger branchlets the decurrent bases are from two to three times longer than their diameter, and in the older ones about four times longer. None of the leaves are accrose. The two on the interior of each joint are marked on the face with a slight depression beneath, which is often a small obscure gland, though none appears externally. The *stamiferous aments* terminate the branchlets. They are ovoid oblong, and from two to three lines in length. The stamens are from 12 to 14, 4-ranked,—the connective produced in a sub-orbicular excentrically peltate scale, and bearing on its under surface about four oblong anther cells, which open longitudinally. The *seminiferous aments* (or strobili) are nearly an inch in length, ovate oblong, and consist of four scales, of which the two exterior are rounded externally, with the flattened septum-like axis prolonged between them, and equalling them in length; all of the scales are mucronate, with a short recurved point below the tip. Beneath each interior scales are two seeds. These are furnished with two very unequal wings. The tree resembles *Callitris quadrivalvis*, Venten., in its foliage, and is nearly related to *Thuja Chilensis* (Hook.)

As a tree, this does not come up to the standard of *Thuja gigantea*, neither reaching its girth nor height, nor approaching it in elegance of contour. It generally grows in groves, in shady valleys at a considerable elevation.

I have already, in the introduction to this paper, given the history of the synonyms of this species. The figures in Torrey's paper (*l. c.*), the Oregon Committee's brochure (*l. c.*), and the "Philadelphia Monthly and Horticultural Advertiser" (*l. c.*), are all very good; and none who has seen them could ever mistake the plant for any other. John Torrey's description of *Libocedrus decurrens*, as might be expected from the character of that eminent botanist, will scarcely admit of amendment; and in my diagnosis I have allowed it to speak for itself, with scarcely any change. Misled by unnaturally dried specimens, he has wrongly described the strobili as "erect." They are, as in nearly all the Coniferae, pendent, though frequently, in Herbaria, they are found in the condition which Dr Torrey described them.

* After Torrey, but corrected in some particulars.

In 1865, though I climbed, or cut down and examined upwards of one hundred trees, I did not get more than a dozen cones; though, from the remains found under the trees, they seem to have been abundantly produced the year previously.

Its geographical range is from about 44° to at least 38° N.L., and west to the Sierras and Cascade Mountains. It does not seem to go further east than these mountains. The tree is found at an elevation of from four or five thousand feet in the Sierra Nevada Mountains in California; but further north in Oregon, it grows at a much lower elevation. I did not find the tree north of Eugene in Oregon (Lat. $44^{\circ} 2' 44''$ N.), and during my journey across the Cascades,* a little southward of this, I found it abundant here and there in the valleys, but very scarce on the eastern side of the mountains. Again, in the Rogue River valley I saw a few trees, and one or two in Josephine County, near Kerbyville, and southward, in the Siskiyou Mountains, it is quite common. Nowhere, where I saw it, did I see any *Thuja gigantea*; and, as I have already remarked, *Thuja gigantea* is a rare tree where this is common, or, indeed, begins to appear; and further north, in Northern Oregon, Washington Territory, Vancouver Island, and British Columbia, *Libocedrus* is entirely unknown. If anything could more distinctly show, than the description of them, the distinctness of the one tree from the other, it is their geographical range. In the county from whence Nuttall got his specimens there is no congener; and there *Libocedrus* is as unknown as in England; and (independently of any other considerations) suppose we knew no better, the only conclusion we could come to, knowing the range of the two species, is that Cooper, Lyall, and other Botanists who mention *Thuja gigantea*, could only mean Nuttall's plant, *Libocedrus decurrens* being an unknown tree in the tracts over which these travels extended. This tree has been introduced into cultivation, but can never, I think, produce any valuable timber, though pretty as a merely ornamental tree. Like nearly all of its allies (*Cupressus* and *Thuja*), it will last long if protected from the air by being underground or in water; if not, the opposite is true. An acquaintance of mine in Southern Oregon (Governor Briggs), told me that he put up a ring fence of this timber, but in two years it was so rotten that you could push it over. In the Calapooya Mountains, and some other places, in default of better timber, it is sawn, but does not make good lumber. It cannot, like *Thuja gigantea*, be easily split into planks, as it is apt to fly into "ribbons." The wood is, however, very light, of a dirty yellowish hue, and thought to be even more durable than redwood (*Sequoia sempervirens*), and I saw it used in some places in house joinery. It has no marked

* "Proc. Roy. Geog. Soc." vol. xi. p. 84 (1867).

varieties in nature, nor has yet the art of the horticulturist produced any.*

Summary.

(1.) In this paper I have endeavoured to show that *T. gigantea*, Nutt., is totally different from *Libocedrus decurrens*, Torr.—a piece of almost unnecessary work, one would think, after seeing the two plants. They differ in everything that can constitute difference, and their geographical range is also markedly dissimilar; that Carrière's *Thuja gigantea* is partly Nuttall's (exclusive of the synonyms), and that Gordon's plant is really not a bad description of *Libocedrus decurrens*, is also tolerably evident; that Hooker's *T. gigantea* is likewise Nuttall's, and that Douglas's *T. Menziesii* is a synonym of *T. gigantea*, has also not been difficult to demonstrate.

(2.) Though the range of the genus *Thuja* is wide, and the range of the two species also considerable on either seaboard, yet it is limited to a great extent to regions lying within the influence of the two oceans—the Atlantic and the Pacific—and does not extend far into the interior. Though, *per se*, distinct enough, yet it appears that they are not so widely separated as might at first sight appear, and that forms such as *Thuja gigantea* var. *plicata* (*Thuja plicata*, *Auctorum*) form connecting links which render it difficult for the botanist to furnish specific characters constant in either species, or for the physical geographer to state their distribution satisfactorily. Between the range of the two species there lie between two and three thousand miles of longitude, with none of their co-genera. Their range in longitude on either side is about similar, though, from the warmer character of the Pacific coast, *T. gigantea* stretches further north on the western side of the country than does its representative species on the eastern. There lies something deeper behind it than we yet understand, and it really sometimes seems that a species may stretch to the outmost bounds of its range, cross over and take new characters to suit it to the new climate and physical circumstances it is subjected to, and here form a new race, in course of time to become the representative species of the original species, of whose family it was once an individual. The want of stragglers all the way over, I know, seems to militate against this theory; but still the great central regions of America, like the centre of all great continents, now too dry to be favourable for the prosperity, or even growth, of arborescent species, might not have been always so. Scarcely a prominent Atlantic species of conifer (or even of deciduous tree) but has its Pacific "representative"—

* *Thuja gigantea divaricata* ("J. Dickson & Sons," in Roy. Bot. Gard. Edin.) and *Thuja gigantea glauca* of the same collection, are only slight variations of *Libocedrus decurrens* produced by cultivation, but so slight as to require no further notice.

<i>Abies Mertensiana</i> ,	<i>Abies Canadensis</i> ,
<i>Pinus ponderosa</i> ,	<i>Pinus rigida</i> ,
<i>Pinus contorta</i> ,	<i>Pinus inops</i> ,
<i>Taxus brevifolia</i> ,	<i>Taxus Canadensis</i> ,
<i>Juniperus Henryana</i> ,* . . .	<i>Juniperus Virginiana</i> .

and many more could be cited, both herbaceous and arborescent species. Every now and then we are meeting trees and plants on the Pacific which are like, but yet are not the same as the Atlantic species, and yet the differences are not sufficient to separate them, though, for convenience' sake, we say that is different, though in our inmost souls we are diffident that it is really different; in other words, that it is the Pacific "representative species" of its Atlantic congener. In some cases we have to cross the rubicon, and really declare them the same. Students of Pacific dendrology are divided into two sects, each at daggers-drawn with the other. The one boldly asserts that no tree on the western slope of the Rocky Mountains is the same as on the eastern slope, but that the latter are the "representative species" of the former; the other that some are specifically the same. There are many connecting forms, no doubt. We may set up an archetype of a Pacific species, and work into this ideal type all the aberrant forms of that species, be it an *Abies*, a *Pinus*, or a *Thuja*; but still our self satisfaction is ever now and again rudely dashed to the ground by some of our aberrant forms meeting with some of the outposts of the "representative species" from the other side of the Rocky Mountains and claiming kindred. There is, I repeat, something deeper, in the phrase, "representative species," than the mere words express. To sum up all, the difference between some of the aberrant forms of *T. gigantea* and *T. occidentalis* are more of *degree* than of *kind*. Some of the sports are wider apart from the mother species than species which are acknowledged as distinct.

(3.) Foliage, I have shown, does not supply characters which can in the least be relied upon to separate species, any more than can the mere form of leaves in herbaceous plants; and the difference of colour, the want of stomata, &c., are due to physical circumstances, and often found on the same tree, parts of which are put under different physical circumstances. No doubt, as in other similar cases, an accidental variety of this nature can be propagated, and produce offspring bearing the features of its parent.

(4.) I have endeavoured finally to reduce the species to what they are in nature, rather than foist children upon her which she disowns. I have far from succeeded to my satisfaction—a feeling which must always be the case with any

* *R. Br. Min. MSS.*—It was sent home by me in 1864 under that name, and is now generally distributed over the country. It will be more fully described.

one who attempts to cleanse the Augean stable of coniferous nomenclature and synonymy.

IV. *On the Vegetable Products, used by the North-West American Indians as Food and Medicine, in the Arts, and in Superstitious Rites.* By ROBERT BROWN, Esq.

On ransacking my various journals and note-books, relating to North-West America, I find scattered through them many notices of the economic plants of the aborigines of these countries. Though these memoranda can be of but little use to civilised art or medicine, yet I have thrown them together, as a contribution to the economic history of plants, and the ethnology of a little known people. The country is however very extensive, and therefore much must be omitted, as there are numerous plants and vegetable products used by some of the tribes which I have never visited, and of which I know nothing except by uncertain hearsay. These notes, therefore, principally relate to my own observations, and chiefly to the Indians on the Pacific seaboard.

The Indians are not much of a phytophagous people. The tribes in the interior live by hunting, and those on the banks of great rivers, such as the Fraser and Columbia, chiefly by fishing, so that they only resort to vegetable diet as an addition to their ordinary food, or as a corrective to the unvarying meals of flesh and fish, chiefly venison and salmon. It is only the miserable Digger Indians—the *gens de pitié* of the voyageurs—who can be said to subsist to any great extent on vegetable food, varying it with grubs, snakes, lizards, and grasshoppers, the latter of which they devour as eagerly as do the Bedouins of the Eastern deserts. Nearly all of the tribes, from the coast to the Rocky Mountains, use as food more or less of the blue lily, the Gamass or *La Gamass* of the voyageurs (*Gamassia esculenta*, Lindl.*), which, in the spring, lends a characteristic aspect to the Western Pacific prairies and open grounds. In Vancouver Island this plant comes into flower about the middle or end of April, and remains in

* A good account of this plant will be found in "Hooker's London Journal of Botany," vol. v. (Geyer.)